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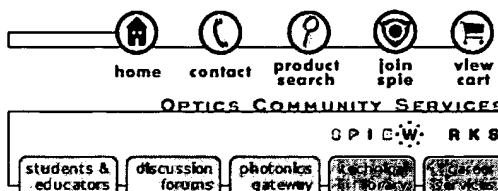
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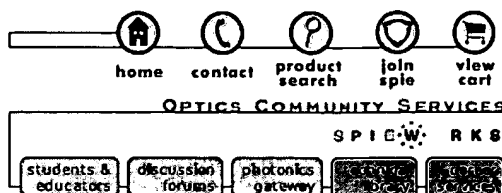
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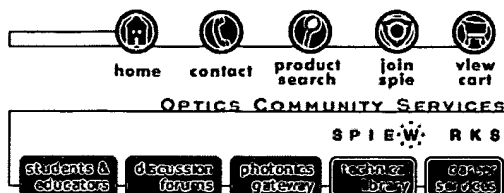
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**Abstract****PUBLICATIONS****Simulation of the optical transmission in 3D imaging systems based on the principle of time-of-flight**

Tai, Wei, Schwarte, Rudolf, Heino, Horst G., Univ. Siegen

 Publication: [Proc. SPIE Vol. 4093, p. 407-414, Current Developments in Lens Design and Optical Systems Engineering, Robert E. Fischer, R. Barry Johnson, Warren J. Smith, William H. Swantner, Eds.](#)

Publication Date: 10/2000

**Abstract:**

A time-of-flight (TOF) system based on a novel Photonic Mixer Device (PMD), which detects and demodulates light simultaneously, has demonstrated that it is feasible to realize a 3-D imaging system with compactness, low cost and sufficient resolution for many applications. Active illumination is used in the TOF imaging system. Because of the limited available light source with large bandwidth and in consideration of eye safety, LEDs or low power laser diodes are used as preferable light sources. The received light may be strongly damped in an order of 40- 50dB, depending on the surface characteristics of the objects. Therefore the optical transmission in the light transmission chain of light source-sender lens-object-reciever lens-(PMD) detector array need to be simulated and optimized in order to achieve better performance and maximal power transmission, by the design of such a 3-D camera. Based on the modeling of the light source (laser diodes and LEDs), lens system and statistical characteristics of objects one is able to simulate the light transmission and the light distribution on the object and the PMD detector array. By the use of time-of-flight of the sensing light it is necessary to keep the phase uniformity of the illumination light, because every detector can possibly receive light from different light ways. This would result in a reduction of detection resolution. The optical-path-differences (OPD) representing the time differences from different paths have been simulated from the source to the related pixel for the designed transmitter lens and the receiver lens. Only one source is usually used by direct current modulation of laser diode or LED for uniform modulation phase. The simulation of the light distribution has given estimation of the light gathering efficiency of every pixel and of possible cross talk between adjacent pixels.

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-	0	((((optic or optical or laser or photo or light or (photo adj electric) or (electro adj photo adj graph)) same (path or beam or route or trajectory or trajectories or direction or axis or axes) same (simulate or simulation or simulating or emulate or emulation or emulating or model or modeling or modelling or calculate or calculation or calculating or calibrate or calibrating or calibration) ) and (("3" adj D) or (three adj (dimension or dimensional)))) and (((path or beam or route or trajectory or trajectories or direction or axis or axes) adj (color)) and ((path or beam or route or trajectory or trajectories or direction or axis or axes) adj (length or distance or diameter)))) and ((moveable or changeable or adjustable or flexible or moving or changing or adjusting or move or change or adjust) adj mirror)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/06/13 21:41
-	30	((((optic or optical or laser or photo or light or (photo adj electric) or (electro adj photo adj graph)) same (path or beam or route or trajectory or trajectories or direction or axis or axes) same (simulate or simulation or simulating or emulate or emulation or emulating or model or modeling or modelling or calculate or calculation or calculating or calibrate or calibrating or calibration) ) and (("3" adj D) or (three adj (dimension or dimensional)))) and (((path or beam or route or trajectory or trajectories or direction or axis or axes) adj (color)) and ((path or beam or route or trajectory or trajectories or direction or axis or axes) adj (length or distance or diameter))))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/06/15 17:35
-	17	(optical adj path adj simulation) or ((electro adj photo adj (graph or graphy)) and (simulate or simulation or simulating or emulate or emulation or emulating or model or modeling or modelling or calculate or calculation or calculating))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/06/15 16:44
-	33	399/411.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/06/13 22:00
-	824	399/220.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/06/13 22:04

-	1257	399/46.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/06/13 22:04
-	104	399/38.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/06/13 22:04